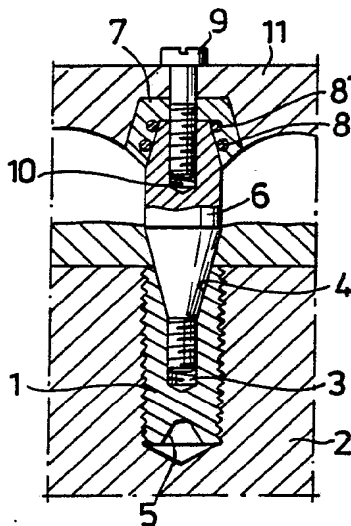


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(54) Title: IMPLANT FOR ATTACHMENT OF DENTAL PROSTHESES



## (57) Abstract

Implant intended to facilitate attachment of dental prostheses against a jaw-bone (2), including an externally threaded screw-shaped member (1), intended to be attached against a threaded hole taken up in the jaw-bone (2). In difference to previously known types of implants, the screw-shaped member (1) includes a blind hole directed from the jaw-bone (2), the first portion of which is a conically tapering portion (4), which is transformed into a internally threaded hole (3). Since the conical portion (4) adjacent to the end surface of the screw-shaped member (1) preferably is arranged with a diameter smaller than the outside diameter of the end portion, and since a cover screw with a conical head which is substantially enclosed by the conical portion (4) is utilized during the osseointegration process, the jaw-bone (2) can be permitted to enclose and encapsulate this end portion of the screw-shaped member (1) during the osseointegration process. A pillar (6) can be attached against the screw-shaped member (1), at an opposed end portion supporting a conical tubular member (7), arranged to facilitate a resilient movement in relation to the pillar (6), whereby a dental prosthesis can be attached having a restricted movement in relation to the jaw-bone (2).

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Implant for attachment of dental prostheses

The present invention relates to an implant for attachment of dental prostheses.

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An implant is an anchoring means, which is specifically intended to facilitate anchoring of dental prostheses in the jaw-bone, and being used when other possibilities of attachment do not exist.

- 10 This type of anchoring means, in the following referred to as an implant, has been used as a previously known type for a number of years, which comprises of an externally threaded screw-shaped member, which is arranged with an upper portion shaped as a cylindrical screw head, having the top portion arranged as an hexagonal attachment portion,
- 15 intended to facilitate attachment with an associated tool. A blind hole extends from said attachment portion, arranged with an internal screw thread. When used, a small incision is made in the buccal mucoperio-steum, thereby revealing the jaw-bone, whereafter a hole is drilled in the jaw-bone, first with a dental drill, thereafter with a larger
- 20 special purpose drill, whereafter the hole is threaded with a screw tap. After cleaning the hole, the screw-shaped member is screwed down into the hole, with use of a special purpose tool, which attaches to the hexagonal attachment portion. A cover screw is thereafter attached to the internally threaded hole in the screw-shaped member, and said cover
- 25 screw includes a screw head which covers the attachment portion existing at the screw-shaped member. The gum is thereafter sewn together over the attached device, which is left during a period of 4 - 6 months to osseointegrate with the jaw-bone. After this period of time, the device is revealed, and the cover screw removed. A pillar, having a first
- 30 portion with cylindrical cross-section extending from an end surface, which is followed by a second portion with a smaller diameter and having an external screw thread, is screwed with the threaded portion into the internally threaded hole within the screw shaped member attached to the jaw-bone. From the end surface wherefrom the first cylindrical portion
- 35 extends, a centrally located blind hole extends into the pillar, arranged with an internal screw thread. A matrix pillar is attached to said threaded hole, arranged substantially corresponding to the previously discussed pillar, apart from the internally threaded hole. A



proof impression is made thereafter, intended to be utilized by a dental technician when manufacturing the bridge, whereafter the matrix pillar and the pillar are removed and the cover screw reattached. The buccal mucoperiosteum is returned back over the members attached to the

5 jaw-bone, pending the completion of the work on the bridge by the dental technician. When manufacturing the bridge, every impression of a matrix pillar is used to accomplish a through hole in the supporting metal structure located behind the teeth front, and when attaching the bridge, the cover screw is removed and replaced by the previously utilized

10 pillar. An attachment screw is applied against the bridge and attached with its threaded portion against the internally threaded hole in the pillar, whereafter the hole in the metal structure of the bridge, above the head of the attachment screw, is filled with a suitable material, e.g. a synthetic resin material. Certain modifications with regard to

15 the above described previously known implant are also known, and particularly with regard to the design of the pillar. As a pillar has thus previously been used a design including a tubular cylindrical member, in combination with a screw-shaped member, which screw-shaped member, in accordance with the member attachable to the jaw-bone, is

20 arranged with a head having a hexagonal attachment member. Said attachment member is, when mounted, embraced by a tubular distance means arranged in an intermediate position between the upper end surface of the cylindrical member and the bridge intended to be attached. The number of implants used is related to the extension of the bridge, but

25 for attachment of a complete bridge, a number of six implants can usually be regarded as sufficient.

However, the above described and previously known implant has a number of disadvantages, and as a result, they can only be used by dentists

30 having received special education, and the cost for each attached implant has also been relatively high. The implants are usually manufactured from titanium, and all the special tools utilized during the operation of attachment are therefore also manufactured from the same material. A normally occurring problem is to accomplish complete

35 matching between the implants attached to the jaw-bone and the metal structure of the bridge, and when the bridge is attached, side directed forces often occur in relation to the members attached to the jaw-bone. The method in which included members abut each other with adjacently



located side surfaces also result in sealing problems, and the design results in a rigid attachment, in difference to natural teeth, which can perform a small movement in relation to the jaw-bone.

- 5 The object of the present invention is to disclose an improved implant, which removes the disadvantages of previously known types, and which includes a small number of parts, which can be supplied and attached to a considerably reduced cost, and previously disclosed problems with regard to sealing and adjustment to the bridge are also substantially removed. It is further disclosed a possibility of accomplishing attachment of the bridge in relation to the jaw-bone in a fashion which substantially corresponds to the attachment of natural teeth, i.e. with a restricted movement in relation to the jaw-bone.
- 10
- 15 The main features of an implant according to the present invention are disclosed in the following main claim, and further characteristic features are disclosed in related sub-claims.

An embodiment of an implant according to the present invention, and certain modifications thereof, are more fully described below with reference to the accompanying drawings, in which:-

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Fig. 1 shows a cross-sectional view of an implant according to the present invention, arranged attached to a jaw-bone and supporting a bridge.

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Fig. 2 shows a cross-sectional view corresponding to Fig. 1, with the implant slightly modified.

30 Fig. 3 shows a cross-sectional view of the implant attached to a jaw-bone during a first stage of the attachment.

Fig. 4 shows a cross-sectional view of the implant during a second stage of the attachment.

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With reference to Fig. 1, the implant according to the present invention includes, as previously known types of implants, an externally threaded screw-shaped members, intended to be attached against a threaded hole



taken up in a jaw-bone 2. In difference to previously known types, the screw-shaped member 1 includes not only an internally threaded blind hole 3, but also an internal conical portion 4, arranged by the first portion of the blind hole which is taken up in the screw-shaped member 1. The screw-shaped member 1 is arranged substantially cylindrical, having at least one cross-wisely extending groove 5 by the end portion which serves as a first end portion during the attachment of the screw-shaped member 1 against the jaw-bone 2. At the opposed end portion, the conical portion 4 is arranged with a smaller diameter than the outside diameter of said end portion.

A pillar 6 is attached against the screw-shaped member 1, including a threaded portion directed towards the screw-shaped member 1, which is followed by a conical portion having a conicity corresponding to the internal conical portion 4. The conical portion at the pillar 5 is preferably arranged having a longer extension, and is followed by a cylindrical portion, which is terminated by a second conical portion against which a tubular member 7 abuts, arranged with an internal conical portion. Adjacent to the internal conical surface of the tubular member 7, two spaced grooves are taken up, in which two O-rings 8, 8' are arranged. The outside surface of the tubular member is also arranged as a conical surface, and on the end surface directed away from the pillar 6, a centrally located through hole is taken up, through which an attachment screw 9 extends, attached against an internally threaded hole 10 taken up in the pillar 6. The head of the attachment screw 9 abuts a supporting metal structure 11, which comprises a part of the bridge intended to be attached.

A slightly modified embodiment is shown in Fig. 2, which only differs from the embodiment shown in Fig. 1 with regard to two aspects. Accordingly, the previously mentioned O-rings 8, 8' have been replaced by a in relation to the pillar 6 and the tubular member 7 intermediately located layer 12 of a compressable material, such as rubber, synthetic rubber, synthetic plastic or similar. Furthermore, the internal conical portion 4 has been arranged extending to the upper edge portion of the screw-shaped member 1, and the cylindrical portion of the pillar 6 is arranged extending to the upper edge portion of the screw-shaped member 1. The intermediately located layer 12 can either be joined with the



conical surface of the conical member 7, or alternatively comprise of a coating joined with the co-acting conical surface of the pillar 6. The layer 12 can also comprise of a conical collar-shaped member, which is placed between the conical surfaces of the pillar 6 and the tubular member 7.

When used, an incision is made in the buccal mucoperiosteum, thereby revealing the jaw-bone 2, whereafter a hole is taken up and threaded, intended to facilitate attachment of the screw-shaped member 1. An attachment tool can comprise of a longitudinally extending member, having one end portion arranged to suit the upper portion of the screw-shaped member 1, i.e. with a threaded portion facilitating attachment against the internally threaded hole 3. When the screw-shaped member 1 has been screwed down into the threaded hole taken up in the jaw-bone 2, the attachment tool is removed, and a cover screw 13 is attached. Said cover screw is arranged with a conical head, the outside surface of which is located adjacent to the upper portion of the screw-shaped member 1. Thereafter the buccal mucoperiosteum is moved back over the cover screw 13, and the screw-shaped member 1 is left for a certain period of time, e.g. 4 months to osseointegrate with the jaw-bone 2. This first stage of the attachment operation is shown more in detail in Fig. 3.

By utilizing the embodiment of Fig. 1, an extremely advantageous effect is accomplished during the osseointegration procedure, due to the possibility offered of encapsulating the attached screw-shaped member 1, since the jaw-bone can grow over the outer and upper edge portions of the screw-shaped member 1, which results in improved anchoring properties, but also substantially removes the risk for penetration of impurities and bacteria cultures down between the screw-shaped member 1 and the threaded hole taken up in the jaw-bone 2. The method in which the cover screw 13 substantially is enclosed by the screw-shaped member 1 is a further advantages in relation to previously known designs, partly due to the improved sealing accomplished by the conical and against each other abutting surfaces, partly due to the fact that the gum is not unnecessarily irritated by a screw head, arranged located above the screw-shaped member 1.



When the necessary period of time for osseointegration has passed, the buccal mucoperiosteum is opened again and the cover screw 13 is removed and replaced by a pillar 6, on which an associated tubular member 7 is located. Thereafter, a proof impression is made, and the tubular members 5 7 are permitted to follow the impression when same is removed. The pillars 6 utilized are thereafter removed and replaced by cover screws 13, whereafter the buccal mucoperiosteum is moved back over the attached implant while waiting for the dental technicians to complete their work with the bridge construction intended to be attached. The method in 10 which included members are located during the proof impression operation is shown in Fig. 4. It should be mentioned, that when manufacturing the bridge, the tubular members 7 are not attached against the supporting metal structure 11, but only holes for same are taken up.

15 When the dental technicians work has been completed, matching and attachment can be performed. The cover screws 13 utilized are revealed and removed, and replaced by pillars 6. On said pillars are thereafter located the conical tubular member 7, and matching in relation to the metal structure of the bridge 11 is checked. During subsequent matching 20 check, when required, necessary adjustment with regard to the holes taken up in the metal structure of the bridge is performed for the tubular members 7. When complete matching has been accomplished, the conical tubular members 7 are cemented to the metal structure 11, whereafter same is lifted off the pillars 6. Provided that the artificial 25 teeth have not already been attached, the metal structure 11 is now returned to the dental technician before final attachment is performed, which is performed by attachment of attachment screw 9 in the holes taken up in the metal structure 11, which are screwed into the threaded hole 10 taken up in the pillars 6. By utilizing O-rings 8, 8', or an 30 intermediately located layer 12, the attached prosthesis receives a certain resilient movement in relation to the jaw-bone, and said resilient movement can be compared to the restricted movement of natural teeth. This effect is particularly advantageous when attaching smaller bridges for a person having natural teeth. The teeth of the bridge will 35 thus achieve a pattern of movement which substantially corresponds with the natural teeth, which must be regarded as a considerable improvement in relation to previous dental prostheses rigidly attached against the jaw-bone.



The implant according to the present invention thus offers a number of advantages in relation to previously known techniques, partly due to the fact that same includes a smaller number of included parts, and thus a smaller manufacturing cost, partly due to the improvement disclosed

5 above with relation to osseointegration properties, simplified and improved matching, as well as with regard to the possibility of resilient attachment now offered. Similar to previously known types of implants, the implant according to the present invention is preferably manufactured from titanium, a material which has been proved suitable

10 for this purpose, but also other materials can be used. As a possible and suitable modification, the conical tubular member 7 can be manufactured from another material, such as a synthetic plastic material with compressable properties, which material would not require O-rings 8, 8', or a layer 12, in order to accomplish desired resilient

15 attachment.

Also other smaller modifications can obviously be made, such as with regard to the method in which attachment is accomplished between utilized tools and the members included in the implant, which obviously

20 can be arranged with attachment means of other types than shown and described.

As such a further modification can also be mentioned the possibility to arrange the conical portion of the pillar 6 directed away from the

25 screw-shaped member 1 with one or a number of grooves in the conical surface, extending in longitudinal direction of the pillar 6. This would offer possibility to attach single teeth with the implant, and to accomplish security against rotation of same from a predetermined position when used. The tubular member 7 can in this case advantageously

30 serve as the supporting metal structure for such a single tooth, and be accomplished by a proof impression operation, whereby its internal conical surface receives outwardly extending portions, which can grip into the grooves taken up in the pillar 6. Furthermore, for such single teeth are obviously previously mentioned intermediately located layers

35 12 used, when a slightly resilient attachment is desired.



C L A I M S

1. Implant, intended to facilitate anchoring of dental prostheses against a jaw-bone (2), including an externally threaded screw-shaped member (1), intended to be attached against a threaded hole taken up in the jaw-bone (2), characterised in that said screw-shaped member (1) in direction away from the jaw-bone (2) is arranged with a substantially centrally located conically tapering hole-shaped portion (4), which is followed by an internally threaded blind hole (3), and that said hole (3) and conical hole-shaped portion (4) during a first osseointegration stage is used to attach and substantially embrace a cover screw (13), and during a later attachment stage is used for attachment of a pillar (6), arranged at the end portion directed away from the screw-shaped member (1) to support a tubular member (7) having in direction from the screw-shaped member (1) a conically tapering outside surface, arranged to facilitate attachment against a co-acting hole taken up in an associated dental prosthesis.
2. Implant according to claim 1, characterised in that the conical hole-shaped portion (4) adjacent to the end surface of the screw-shaped member (1) has a smaller diameter than the diameter of said end surface.
3. Implant according to any of claims 1 and 2, characterised in that the cover screw (13), which during a first stage is used attached to the screw-shaped member (1), is arranged with a conical screw head having a shape and extension substantially corresponding to the conical hole-shaped portion (4) in the screw-shaped member (1).
4. Implant according to any of claims 1 - 3, characterised in that the pillar (6) includes a centrally and substantially cylindrical portion, which at a first end portion is transformed into a conically tapering portion having a configuration and extension substantially corresponding to the conical hole-shaped portion (4) in the screw-shaped member (1), and with an externally threaded portion extending therefrom, attachable against the internally threaded blind hole (3), and that the second end portion is arranged as a conically tapering part, including a centrally located internally threaded blind hole (10).



5. Implant according to any of claims 1 - 4, characterised in that the tubular member (7) is arranged with both a conical outside and inside surface.

5 6. Implant according to any of claims 1 - 5, characterised in that in  
an intermediate position in relation to the pillar (6) and the tubular  
member (7) are arranged one or a number of resilient compressable means  
(8, 8'), arranged to facilitate a restricted movement of the tubular  
member (7) in relation to the pillar (6).

10

7. Implant according to any of claims 1 - 5, characterised in that  
intermediately located between the pillar (6) and the tubular member (7)  
is arranged a layer or a coating of resilient compressable material,  
arranged to facilitate a restricted movement of the tubular member (7)

15 in relation to the pillar.

8. Implant according to any of claims 1 - 5, characterised in that the  
tubular member (7) is manufactured from a resilient compressable  
material, such as synthetic plastic or similar.

20

9. Implant according to any of claims 1 - 8, characterised in that the  
tubular member (7) is attached against the supporting metal structure  
(11) of the dental prosthesis by means of cementation, glueing or  
similar, when the prosthesis is tried out for matching.

25

10. Implant according to any of claims 1 - 9, characterised in that a  
conical portion of the pillar (6) directed away from the screw-shaped  
member (1) includes at least one groove taken up in the surface,  
extending in longitudinal direction of the pillar (6), arranged in a  
30 number corresponding to outwardly extending portions at the internal  
conical surface intended to be attached in an adjacent position to the  
conical portion of the pillar (6).

35



Fig. 1

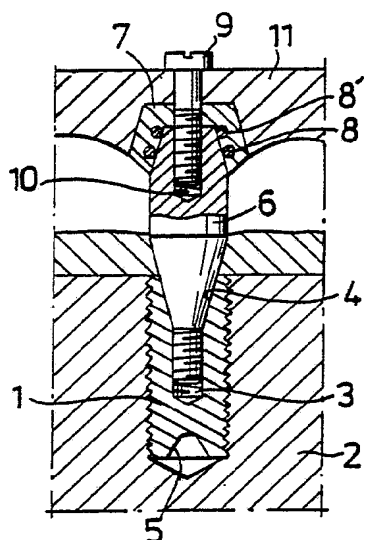


Fig. 2

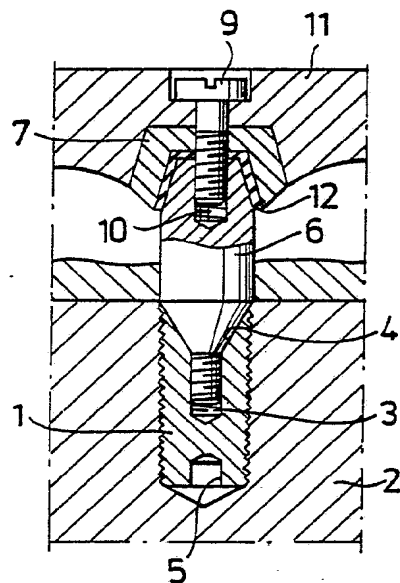


Fig. 3

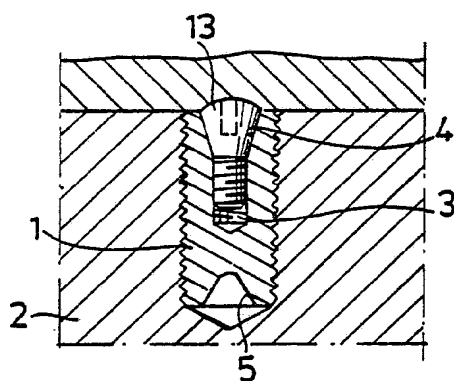
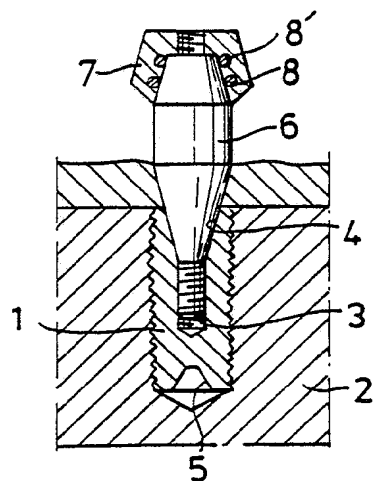


Fig. 4



# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE84/00403

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>1</sup> According to International Patent Classification (IPC) or to both National Classification and IPC <sup>4</sup> <div style="text-align: center; margin-top: 10px;">A 61 C 8/00</div>																	
<b>II. FIELDS SEARCHED</b> <div style="text-align: center; margin-top: 10px;">Minimum Documentation Searched <sup>6</sup></div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%;">Classification System</th> <th style="width: 80%;">Classification Symbols</th> </tr> <tr> <td>IPC 4</td> <td>A 61 C 5/08, 8/00, 13/00, 10, 12, 225, 26, 30</td> </tr> <tr> <td>US C1</td> <td>32:10; 433:172-177, 218-221</td> </tr> </table> <div style="text-align: center; margin-top: 10px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>6</sup></div> <div style="margin-top: 20px;">SE, NO, DK, FI classes as above</div>			Classification System	Classification Symbols	IPC 4	A 61 C 5/08, 8/00, 13/00, 10, 12, 225, 26, 30	US C1	32:10; 433:172-177, 218-221									
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<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%;">Category <sup>5</sup></th> <th style="width: 60%;">Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup></th> <th style="width: 30%;">Relevant to Claim No. <sup>18</sup></th> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>SE, B, 328 961 (AGA AB) 28 November 1970</td> <td></td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>SE, B, 328 962 (AGA AB) 28 November 1970</td> <td></td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>SE, B, 332 486 (AGA AB) 8 February 1971</td> <td></td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>DE, A, 2 401 323 (J-M PORTOUKALIAN ET AL) 12 January 1973</td> <td></td> </tr> </table>			Category <sup>5</sup>	Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>	A	SE, B, 328 961 (AGA AB) 28 November 1970		A	SE, B, 328 962 (AGA AB) 28 November 1970		A	SE, B, 332 486 (AGA AB) 8 February 1971		A	DE, A, 2 401 323 (J-M PORTOUKALIAN ET AL) 12 January 1973	
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>15</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p> </div> </div>																	
<b>IV. CERTIFICATION</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">           Date of the Actual Completion of the International Search <sup>1</sup>  <div style="text-align: center; margin-top: 10px;">1985-02-05</div> </td> <td style="width: 50%; padding: 5px;">           Date of Mailing of this International Search Report <sup>1</sup>  <div style="text-align: center; margin-top: 10px;">1985-02-12</div> </td> </tr> <tr> <td style="padding: 5px;">           International Searching Authority <sup>1</sup>  <div style="text-align: center; margin-top: 10px;">Swedish Patent Office</div> </td> <td style="padding: 5px;">           Signature of Authorized Officer, <sup>20</sup>  <div style="text-align: center; margin-top: 10px;">              Jack Hedlund           </div> </td> </tr> </table>			Date of the Actual Completion of the International Search <sup>1</sup> <div style="text-align: center; margin-top: 10px;">1985-02-05</div>	Date of Mailing of this International Search Report <sup>1</sup> <div style="text-align: center; margin-top: 10px;">1985-02-12</div>	International Searching Authority <sup>1</sup> <div style="text-align: center; margin-top: 10px;">Swedish Patent Office</div>	Signature of Authorized Officer, <sup>20</sup> <div style="text-align: center; margin-top: 10px;">              Jack Hedlund           </div>											
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